



Section 3

EO-1 Mission Overview



What is EO-1?



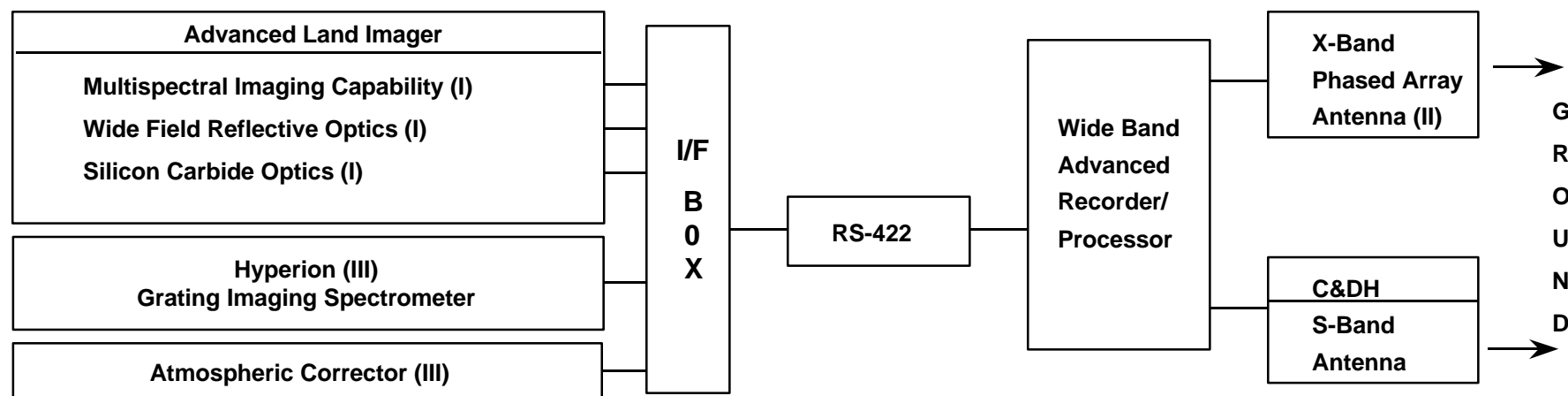
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Web Site @

<http://eo1.gsfc.nasa.gov/>

- ◆ *Designed to flight validate breakthrough technologies applicable to Landsat follow-on missions*
- ◆ *Specifically responsive to the Land Remote Sensing Policy Act of 1992 (Public Law 102-55) wherein NASA is charged to ensure Landsat data continuity through the use of advanced technology:*
 - *Multispectral Imaging Capability to address traditional Landsat user community*
 - *Hyperspectral Imaging Capability to address Landsat research-oriented community -- backward compatibility essential*
 - *Calibration test bed to improve absolute radiometric accuracy*
 - *Atmospheric correction to compensate for intervening atmosphere*

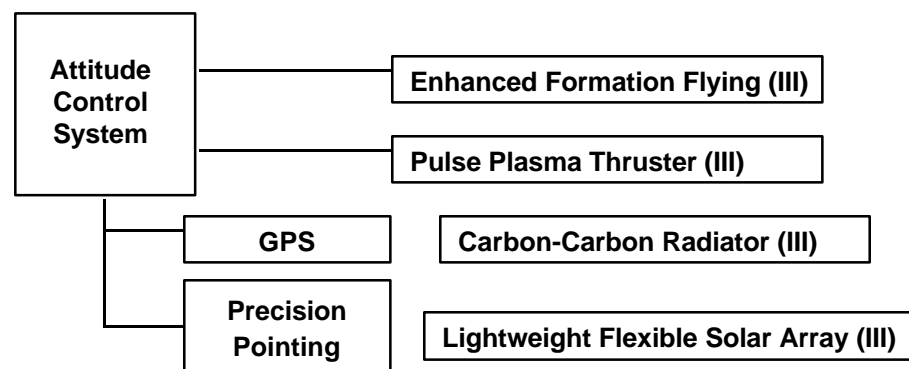


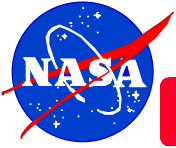
EO-1 Technologies



EO-1 TECHNOLOGIES

- ◆ Multispectral Imaging Capability
- ◆ Wide Field Reflective Optics
- ◆ Silicon Carbide Optics
- ◆ Grating Imaging Spectrometer (HYPERION)
- ◆ Atmospheric Corrector (AC)
- ◆ X-Band Phased Array Antenna
- ◆ Enhanced Formation Flying (EFF)
- ◆ Pulse Plasma Thruster (PPT)
- ◆ Carbon-Carbon Radiator (CCR)
- ◆ Lightweight Flexible Solar Array
- ◆ Wideband Advanced Recorder / Processor (WARP)
- ◆ Global Positioning System (GPS)
- ◆ Precision Pointing





NMP Technology Categories

CATEGORY I

- ♦ ***Essential Technology***
- ♦ ***Willing to restructure mission in order to fly it***
- ♦ ***If technology gets into trouble -- you fix it***
- ♦ ***Part of minimum mission***

CATEGORY II

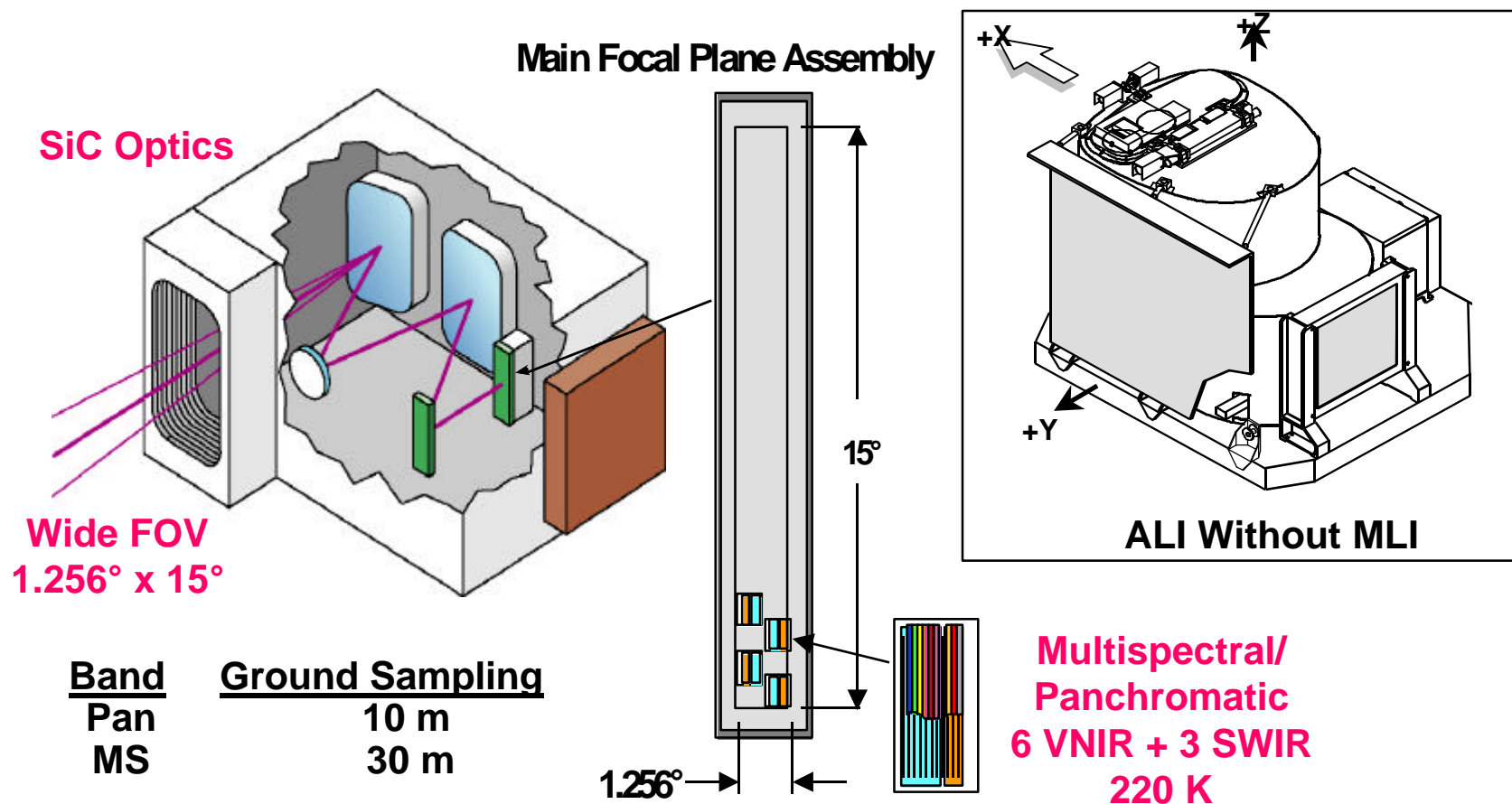
- ♦ ***Technology provides an essential mission function***
- ♦ ***A conventional approach is pre-planned***
- ♦ ***If technology gets into trouble -- you switch to the conventional approach***

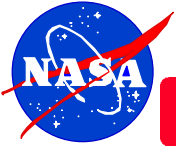
CATEGORY III

- ♦ ***Technology exercises a flight opportunity***
- ♦ ***If technology gets into trouble -- you defer it to a later flight***

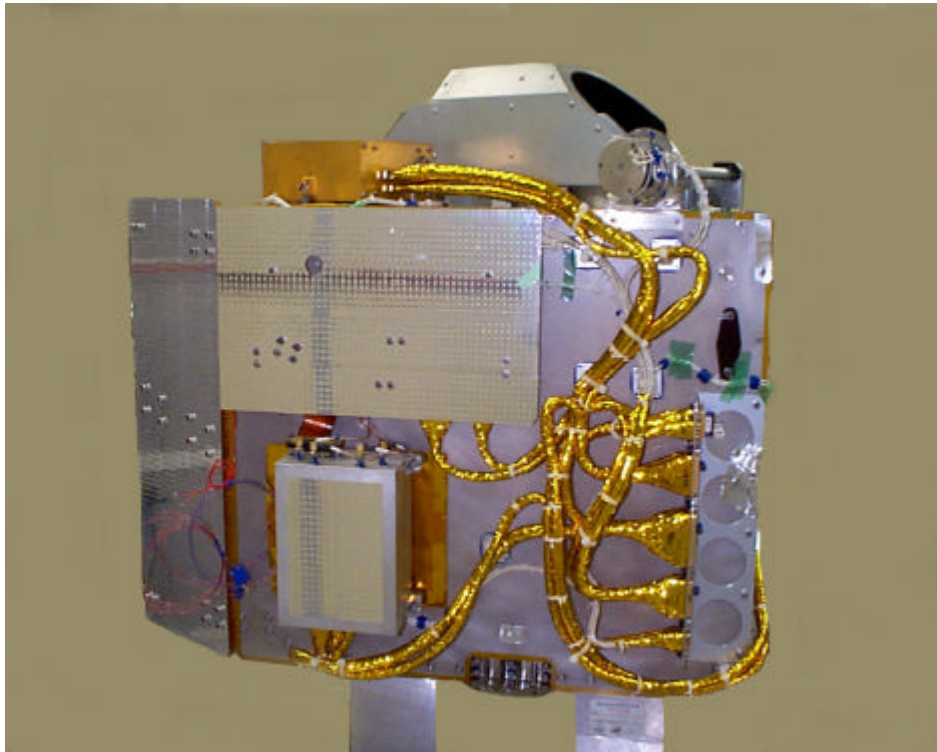


Advanced Land Imager (ALI)

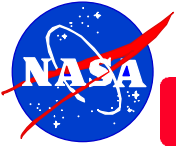




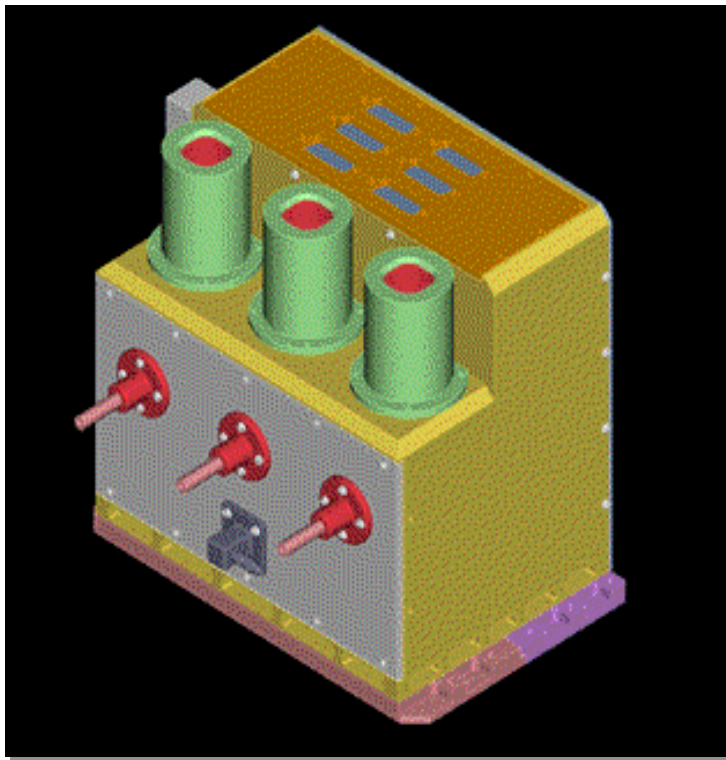
Hyperion Imaging Spectrometer



- ◆ ***Convex Grating spectrometers with CCD VNIR and HgCdTe SWIR detectors***
- ◆ ***30m spatial and 10nm spectral resolutions over 7.5km swath and 400-2500nm spectral range***
- ◆ ***Multiple calibration options: lamps, lunar, solar, ground imaging and laboratory***
- ◆ ***Hyperspectral Imaging Capability to address Earth Observation applications***



LEISA Atmospheric Corrector



- ◆ *Correction of multispectral surface imagery for atmospheric variability (water and aerosols)*
- ◆ *High spectral, moderate spatial resolution (250m), large swath (180km) hyperspectral imager using wedge filter technology*
- ◆ *Spectral coverage of 0.89 - 1.6 μ m, bands selected for optimal correction of high spatial resolution images*



EO-1 Spacecraft

◆ Power

- 315 Watts
- 50 Ahr
- Super NiCd

◆ Data Storage

- Housekeeping: 1 Gbit
- Science: 48 Gbits

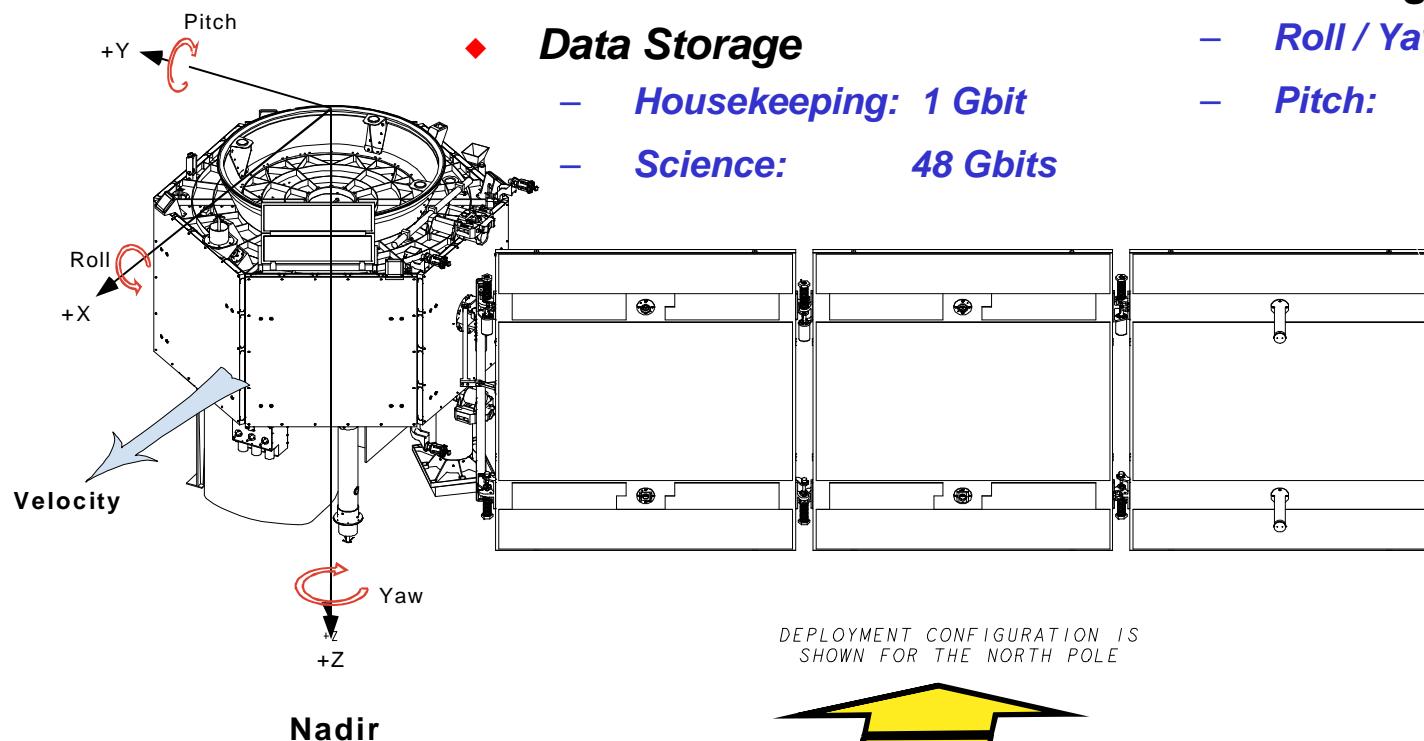
◆ Articulating Si Solar Array

◆ Mass

- 588 Kg

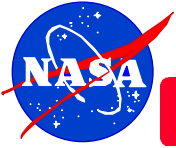
◆ ALI Pointing

- Roll / Yaw: 0.022°
- Pitch: 0.033°



DEPLOYMENT CONFIGURATION IS
SHOWN FOR THE NORTH POLE



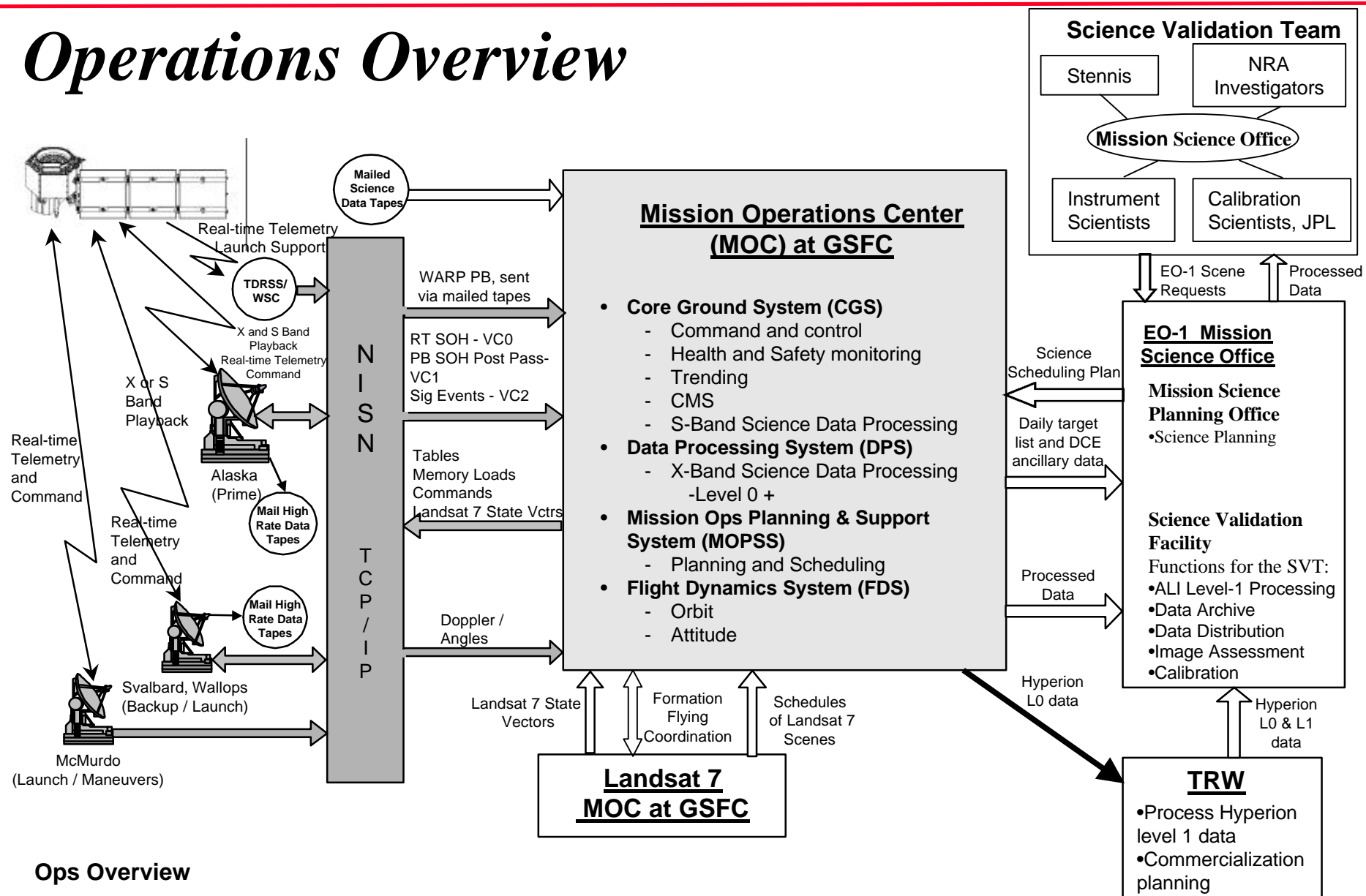


Spacecraft Technologies

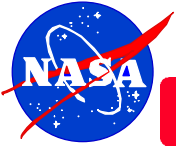
- ◆ *Wideband Advanced Recorder / Processor (WARP)*
- ◆ *X-Band Phased Array Antenna*
- ◆ *Enhanced Formation Flying*
- ◆ *Pulse Plasma Thruster*
- ◆ *Carbon-Carbon Radiator*
- ◆ *Lightweight Flexible Solar Array*
- ◆ *Global Positioning System*
- ◆ *Precision Pointing*



Operations Overview



Ops Overview



Ground System Requirements Summary

*Ground stations to
receive, process,
and route science
and HK data to
GSFC*

- ◆ ***X-Band: Receive 160 Gbits per day for the first 120 days and 80 Gbits per day at 105 Mbps thereafter***
 - *Record the received X-band data on hard media, mail to GSFC, and store raw data for 30 days*
- ◆ ***S-Band: Receive data at selected rates up to 4 Mbps***
 - *Housekeeping data: Route selected virtual channels to GSFC in real time, record up to 200 Mbits of data each day, and FTP recorded data to GSFC within one hour. Store raw data for 30 days.*
 - *Backup science data (up to 10 Gbits per day): Process as with X-band.*
- ◆ ***Perform Level 0 processing on the science and HK telemetry***
 - *Fill holes, reorder science into band order*

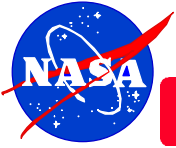


Ground System Requirements Summary

(continued)

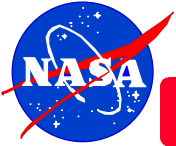
*GSFC to receive
and process data
sent from the
ground station*

- ◆ ***Process MS/PAN science data to provide at least 200 paired scene comparisons with Landsat-7***
- ◆ ***HYPERION Science Processing at TRW***
- ◆ ***Maintain an orbit of sufficient precision for scene comparisons***
 - ***Follow Landsat-7 Ground Track ± 3 km and » 1 minute behind***
- ◆ ***Maintain the health and safety of the spacecraft***
- ◆ ***Validate and calibrate onboard orbit and attitude subsystems***
- ◆ ***Perform orbit maneuver control to enable formation flying***
- ◆ ***Provide mission planning and command management***
- ◆ ***Archive raw and processed data***



Operational Phases

- ◆ **Launch & Early Orbit**
 - ✓ *Launch and the first several orbits, spacecraft checkout, and instrument turn-ons*
 - ✓ *Approximately 15 days (20 days to get to 1 minute behind Landsat)*
 - ✓ *1 minute behind Landsat 7*
- ◆ **Instrument Checkout**
 - ✓ *Full instrument checkout*
 - ✓ *Approximately 60 days*
- ◆ **Nominal Ops**
 - *Science Validation*
 - *10 months*
- ◆ **End of Life**
 - *Deorbit burn for reentry within 25 years*



Summary of Mission Overview

- ◆ ***The EO-1 mission is responsive to the 1992 Land Remote Sensing Act wherein NASA will use advanced technology to ensure Landsat data continuity***
- ◆ ***It will flight validate improvements in:***
 - *Multispectral imaging*
 - *Hyperspectral imaging*
 - *Calibration*
 - *Atmospheric Correction*
 - *Spacecraft technologies useful to remote sensing*
- ◆ ***The mission was successfully launched on November 21, 2000***
- ◆ ***Selected EO-1 imagery will be available soon at:***
[*http://eo1.gsfc.nasa.gov/miscPages/images.html*](http://eo1.gsfc.nasa.gov/miscPages/images.html)